Prepared by the North Dakota Legislative Council staff for the Agriculture Committee
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BIODIESEL FUEL AND ITS INTEGRATION INTO THE AGRICULTURAL ECONOMY OF THIS STATE - BACKGROUND MEMORANDUM

House Bill No. 1390 (2001) (attached as an appendix) directs the Legislative Council to study the use of biodiesel fuel in this state, including the fuel's operational impact on engines, its impact on engine warranties, fuel economy, economic impact, environmental impact, marketing, potential for public use, its benefits in cold flow conditions, its microbial impacts, demands for biodiesel fuel, tax incentives to promote its usage, the current supply of biodiesel fuel, and the potential for constructing biodiesel plants in or near this state.

BIODIESEL - DESCRIPTION

Biodiesel is a diesel fuel substitute that is produced from renewable sources such as vegetable oils, animal fats, and recycled cooking oils. Chemically, it is defined as the mono-alkyl esters of long chain fatty acids derived from renewable lipid sources. Biodiesel is typically produced through the reaction of a vegetable oil or animal fat with methanol or ethanol in the presence of a catalyst to yield glycerin and biodiesel. Biodiesel can be used in neat form or blended with petroleum diesel for use in diesel engines. The physical and chemical properties of biodiesel, as they relate to the operation of diesel engines are similar to petroleum-based diesel fuel. It is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatic compounds.

The concept of using vegetable oil-based fuel dates back to 1895, when Dr. Rudolf Diesel developed the first compression-ignition engine specifically to run on vegetable oil. Because it has similar properties, biodiesel can be blended in any ratio with petroleum diesel and can be used in diesel engines with no major modifications, beyond those involving certain hose and fuel line substitutions.

ATTRIBUTES OF BIODIESEL

Degradation

The current key biodiesel markets are mass transit, marine, and other environmentally sensitive areas, such as mines. In the marine industry, it is gaining favor because it has high degradation attributes. Recent studies at the University of Idaho compared the biodegradation of biodiesel in an aqueous solution to that of diesel fuel and dextrose--sugar. Biodiesel samples degraded more rapidly than dextrose and were 95 percent degraded after 28 days. At the end of the same period, diesel fuel was only 40 percent degraded. Even when blended, biodiesel accelerates the rate of diesel fuel biodegradability. A blend of 20 percent biodiesel with 80 percent diesel fuel degrades twice as fast as No. 2 diesel.

Flashpoint

For the mining industry, among others, an important aspect of biodiesel is its flashpoint--the temperature at which the fuel becomes a mixture that will ignite when exposed to a spark or flame. In research conducted by the Southwest Research Institute, an independent, nonprofit, applied engineering and physical sciences research and development organization based in Texas, the flashpoint of biodiesel blends was shown to increase as the percentage of biodiesel increased. Pure biodiesel and blends of biodiesel with petroleum diesel were therefore found to be safer to store, handle, and use than conventional diesel fuel.

Toxicity

Another important aspect of biodiesel is its toxicity level. Health effects can be measured in terms of a fuel's toxicity to the human body or health impacts due to exhaust emissions. Wil Research Laboratories, an interdisciplinary, nonclinical, contract research organization based in Ohio, investigated the acute oral toxicity of pure biodiesel fuel, as well as that of a 20 percent blend in a single-dose study on rats. The median lethal dose of pure biodiesel, as well as that of a 20 percent blend, was found to be greater than 5,000 mg/kg. The acute dermal toxicity of neat biodiesel was evaluated in a single dose study involving rabbits. The median lethal dose of biodiesel was found to be greater than 2,000 mg/kg and the 2,000 mg/kg dose level was found to be a no observable effect level (NOEL) for system toxicity. There were no deaths, remarkable body weight changes, or gross necropsy findings.

Acute aquatic toxicity tests were also conducted and demonstrated that biodiesel is less toxic than both diesel fuel and table salt.

Emissions

With respect to emissions reductions, biodiesel in a conventional diesel engine results in a substantial reduction of unburned hydrocarbons, carbon monoxide, and particulate matter. Emissions of nitrous oxides are either slightly reduced or slightly increased, depending

on the duty cycle of the engine and the testing methods employed. Particulate emissions from conventional diesel engines are generally divided into three components. The first is carbonaceous material--carbon particles most often associated with the visible smoke of diesel exhaust. The second component is hydrocarbon material, which is absorbed on the carbon particles, and the third is engine lubrication oil that passes by the piston oil rings. This final component consists of sulfates and bound water. The use of biodiesel serves to decrease the solid carbon fraction of the particulate matter and eliminates the sulfate fraction, while the soluble or hydrocarbon fraction stays the same or is increased.

In addition to reducing the overall levels of pollutants and carbon, the compounds that are prevalent in biodiesel and diesel fuel exhaust are different. Furthermore, the total speciated hydrocarbon mass of biodiesel is nearly 50 percent less than that measured for conventional diesel fuel, and the associated ozone potential is reduced by the same amount.

Lubricity

Of greater significance to many fleet operators is biodiesel's lubricity levels. In this country, the sulfur level of diesel use for on-road purposes is limited to 0.05 percent by weight. This limit was imposed by the Environmental Protection Agency in October 1993 as a way to decrease particulate matter emitted from diesel-powered engines. However, fleet managers found that by using low-sulfur diesel fuel, injection pumps began to wear prematurely. Pump manufacturers determined that countering the premature wear would require lubricity additives in the fuel. The Southwest Research Institute has found that biodiesel provides significant lubricity over that of petroleum diesel fuel. The institute found marked improvements in lubricity even in blends as low as 1 percent.

RESOURCE AND MARKET ISSUES

The development and commercialization of not only biodiesel, but biofuels technology in general, depends on and, conversely, influences several issues of national importance. At the root of these issues is the finite nature of our planet's petroleum resources and the implications of our dependence on them. The benefits of biofuels and the influences on the development of biofuels technology are inextricably linked to three vital factors in the continuing stability of the country and very powerful day-to-day influences on the economy, the environment, and energy.

Economy

The United States economy is closely tied with crude oil, e.g., a $1 change in the barrel price of crude oil can lead to a $1 billion change in the level of oil imports. Because oil imports account for almost half of the United States trade deficit, any variation in price can have an enormous impact.

Today, the United States imports more than 53 percent of its petroleum. Much of this petroleum comes from the Persian Gulf region, which holds roughly two-thirds of the world's known oil reserves. By the year 2010, the United States is expected to import more than 75 percent of its petroleum.

United States Military and Oil

In order to maintain the uninterrupted flow of oil from the Persian Gulf region, the United States engages in expenditures of approximately $57 billion per year. During the 1980s this figure was, according to the United States General Accounting Office, approximately $36.5 billion per year. It covers both military and foreign aid expenditures in the region. When military and energy security factors are taken into account, the true cost of oil is as high as $100 a barrel or $5 a gallon. This dollar figure does not include the cost of any actual military engagements. The price tag for the Persian Gulf War, for example, was in excess of $61 billion.

United States Agricultural Economy and Biofuels

The use of biofuels, whether biodiesel or other alternative fuels, can impact many sectors of the United States economy, not the least of which is agriculture. If the biofuels industry and market can grow to the point where increased feedstock supplies are needed, the agricultural sector can be expanded to meet those needs. Opportunities would exist for farmers to grow new crops and to increase production of traditional crops with new usages.

Much of the revenue for manufacturing, installing, fueling, and operating biofuel plants could be maintained in the region actually providing the feedstock. This type of activity would generate jobs both in the agricultural sector and in local communities.

Concerns From Other Sectors

In testimony presented during the 2001 legislative session, representatives of nonagricultural interests raised a number of concerns about potential mandates regarding the usage of biodiesel fuel. The concerns addressed factors such as:

1. The lack of operating experience with biodiesel in equipment;
2. The lack of data to accurately determine the cost associated with using biodiesel fuel and

whether or not additional costs could be passed on to consumers;
3. The creation of an inherent inequity resulting from one fuel type being favored over another;
4. The lack of standards for biodiesel fuel;
5. The impact that biodiesel fuel usage has on diesel engine reliability;
6. The impact that biodiesel usage would have on diesel engine warranties; and
7. The lack of an adequate supply infrastructure.

RECENT LEGISLATIVE EFFORTS IN OTHER STATES

Arizona

Under prior legislation, political subdivisions were required to implement vehicle fleet plans for the purpose of encouraging and progressively increasing the use of alternative fuels and clean-burning fuels. Diesel fuel substitutes were limited, however, to only 50 percent of plan compliance. House Bill No. 2123 (2001) eliminated the 50 percent cap, thereby allowing political subdivisions to meet their entire plan requirements with fuels such as biodiesel.

Connecticut

House Bill No. 6319 (2001) would have recognized biodiesel as an alternative fuel. The bill was tabled in the House.

House Bill No. 6224 (2001) would have reduced the sales tax on biodiesel. The bill was not reported out of the committee to which it was referred.

House Bill No. 6395 (2001) would have established a biodiesel task force to promote the use of biodiesel fuel and to explore its commercial and industrial applications in order to reduce pollution and dependence on foreign oil. The bill was not reported out of the committee to which it was referred.

Delaware

House Bill No. 162 (2001) would have exempted the sale, delivery, and use of biodiesel fuel from motor fuel taxes otherwise imposed on the sale, delivery, and use of special fuels in the state. The bill's content was replaced with other content.

Hawaii

House Bill No. 661 (2001) would have established a comprehensive used oil collection and recycling program. The bill was deferred until the 2002 legislative session.

House Bill No. 1281 (2001) would have established a preference in state contracts for the use of biofuels. The bill was deferred until the 2002 legislative session.

House Bill No. 1345 (2001), which was enacted, reduces the fuel tax rate on alternative fuels.

Illinois

House Concurrent Resolution 0385 (2001) urges the President of the United States and the United States Congress to ensure ethanol and biodiesel are included as part of any lasting energy policy and that these fuels are given a prominent place in national energy policy. The resolution was adopted.

Iowa

Senate File 9 (2001) would have directed the State Department of Transportation to purchase biodiesel fuel for department motor vehicles that operate on diesel fuel. Beginning July 1, 2001, at least 25 percent of the department's annual diesel fuel purchases would have had to be biodiesel fuel, and this percentage would have had to increase by 25 percent annually until 100 percent of such purchases would have been biodiesel fuel. The bill would also have required department motor vehicles operating on biodiesel fuel to be affixed with a sticker notifying the traveling public that the vehicle uses biodiesel fuel. The bill was not reported out of the committee to which it was referred.

Kansas

Senate Bill 4 (2001) would have required that all bulk fuels purchased by state agencies contain at least 2 percent biodiesel. This requirement was to have been waived if the cost of such blended fuel exceeded the cost of regular diesel fuel by 10 cents or more per gallon. The bill was not reported out of the committee to which it was referred.

Minnesota

House File No. 362 (2001) would have required all state-owned or state-operated vehicles having diesel engines to use at least 5 percent biodiesel fuel. The bill was passed by several committees and ultimately referred to the Ways and Means Committee.

Texas

House Bill No. 788 (2001) would have required a comprehensive study of the economic effect of ethanol and biodiesel production in the state. The bill was not reported out of the Senate Natural Resources Committee.

Washington

Senate Bill No. 5492 (2001) would have waived sales taxes on alternative fuel vehicles and provided tax credits for persons who purchased or leased alternative fuel vehicles for at least three years, and for persons who installed alternative fuel storage tanks. The bill was not reported out of the Ways and Means Committee and has been reintroduced in the current special session.

North Dakota

House Bill No. 1390 (2001), as introduced, would have required all diesel fuel sold or offered for sale after December 31, 2001, to contain at least 2 percent biodiesel. The House Finance and Taxation Committee replaced the original content of the bill with the study of biodiesel usage in this state.

ATTACH:1